RHIC Retreat 2000
RF Systems:
Focus on Continuity

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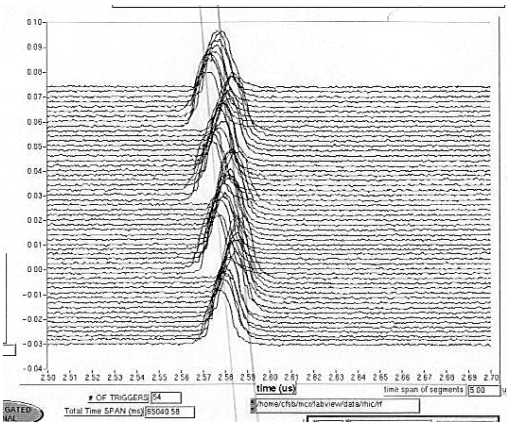
RF Group

November 16, 2000

- **Injection**
- **Acceleration**
- **Transition**
- **Cogging**
- **Storage**

Injection

1. **Kicker trigger jitter, $\pm$ 6 ns**

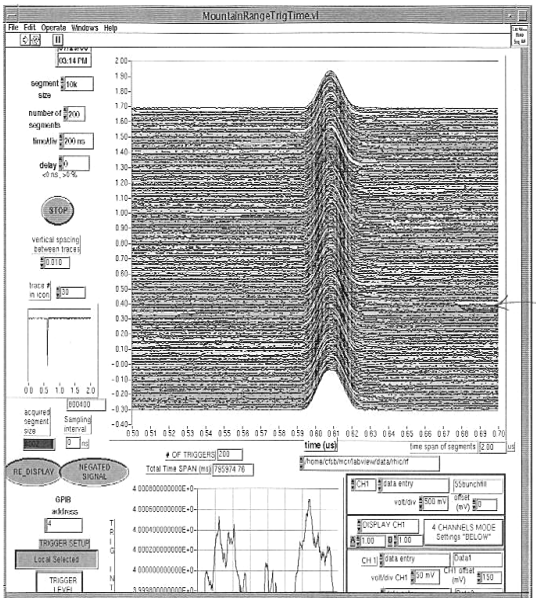


2. **Energy match drift**
   - **Morning numbers**
   - **Correction by operations (.tcl)**
   - **New frequency standard, 10^{-11} GPS disciplined**

3. **Phase and energy fluctuations**
   - **x 4 larger than anticipated**
   - **upgrade capability of injection damper**
   - **commission injection damper**

4. **IBS at injection**
   - **How much time for filling? (γ^4)**

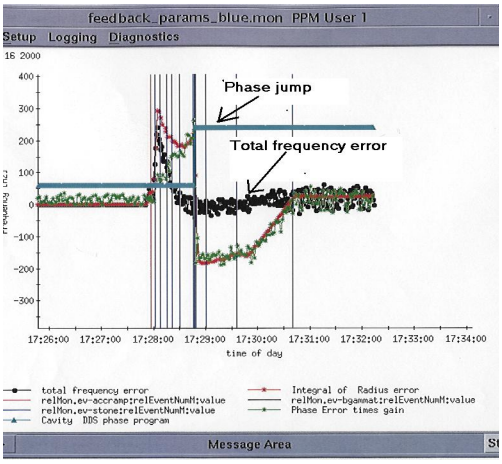
See W. Fischer's talk

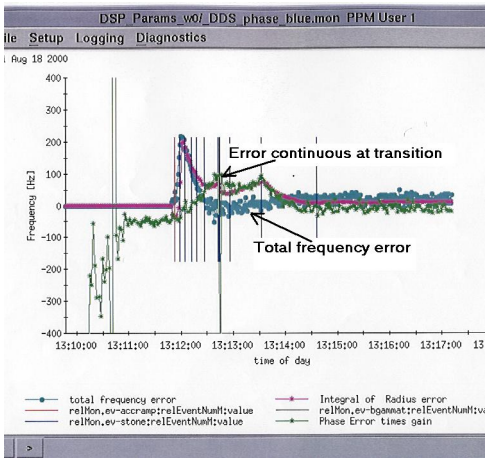


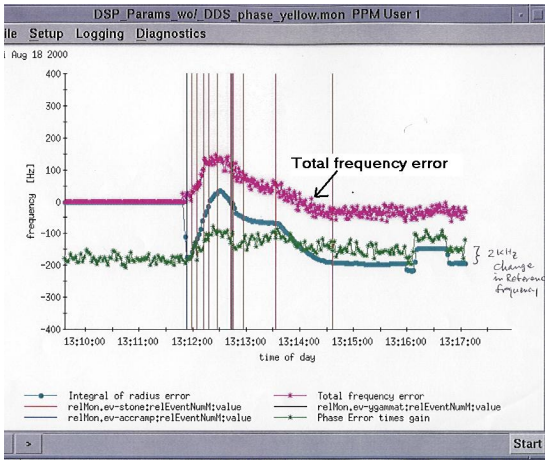
Acceleration

1. DSP parameters

- **Debugging tool, (tight clamps)**
- **Valuable feedback on "average orbit"**







$\varphi_s \rightarrow \pi - \varphi_s$ **Typical Blue** **Typical Yellow**

2. Paramount importance of orbit control at rf BPMs (N.B. automatic tune control)

3. New Phase Detector will have greater dynamic range (was ≤ 20:1)

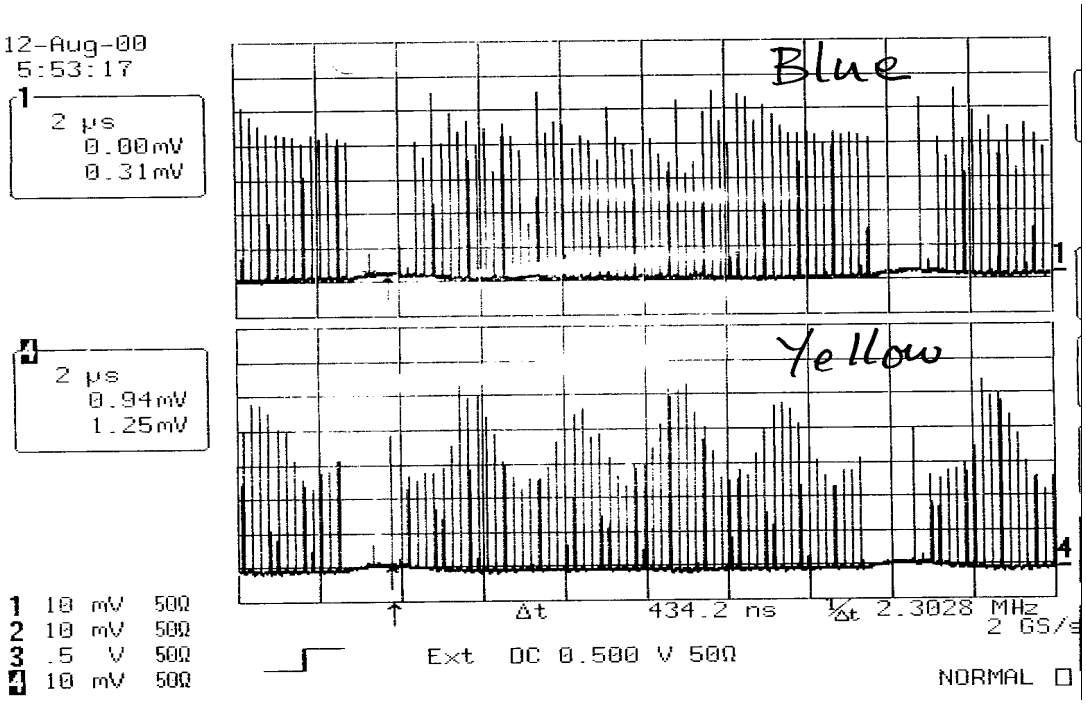
- **Better signal/noise on phase data**
- **Will hold on even with substantial beam loss**

Transition

1. Analog scope views

- bunches get very short, ½ ns FWHM
- Yellow sometimes “breaks up” before transition

2.Evidence of coupled-bunch instability



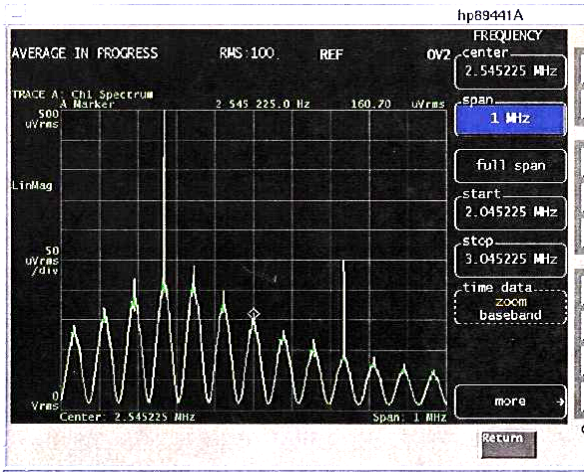
- Wall current monitor signals from both rings
- Shows intensity only (will have phase data now)
- Consistent difference between yellow and blue
- “develops just before transition”

3. Someone turn on the jump…PLEASE!

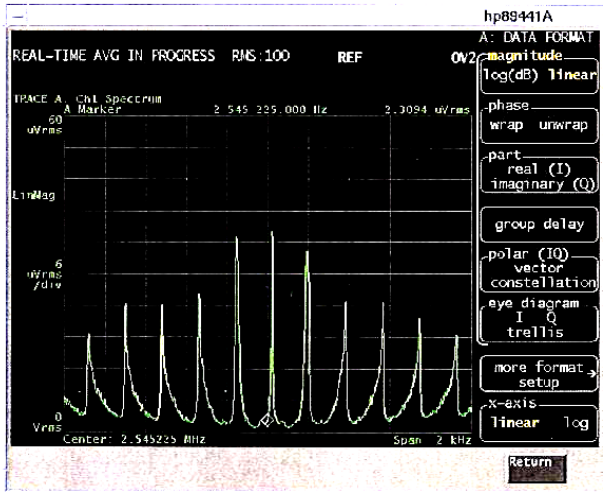
4. Schottky signals

Schottky Signals Provide Unparalleled Accuracy in Measurement of Synchrotron Tune

- Span covers > one harmonic of bunch frequency
- Six bunches enhance every sixth Frev line
- Envelope reflects bandwidth of pickup



- Zoom on middle Frev
- Synchrotron sidebands frequency gives Vrf, $\eta(\gamma_T)$
- Shape of lines reveals distribution
- rf feedback loops mess up the spectrum



Cogging

1. The goal is to make it truly Auto

2. Will add some new smarts to the DSP software to eliminate lock acquisition failure

- **New frequency reference will help**
- **Why was there always a 2 mm difference between blue and yellow?**

3. Scanning the collision point is incompatible with the common cavities

Storage rf

1. We have to learn rebucketing , no satellites

2. rf noise should not contribute to luminosity lifetime, IBS should dominate

- Loops-off phase noise seems to be ok
- Amplitude noise hasn't been measured
- New gear at 200 MHz has to work

3. Storage system hardware

- Hardware modifications still in progress
    1. Continuous operation
    2. New frequency (cavity and power amp)
    3. High gain rf feedback
    4. Moving the damper with beam
- Vacuum problems
    1. redesigned windows are on order
    2. will have spool pieces in the worst case

4. Need beam time to commission this system